

Nitrates in Animals

July 2025

E.D.
State Public Health Veterinarian
Oregon Health Authority

Introduction

- **Definition:** Nitrate poisoning occurs when animals consume high levels of nitrate.
- Nitrates are naturally found in many plants and soils and become harmful under certain conditions.
- The condition is more common in ruminants (like cattle and sheep) but can affect pets as well.
- Importance: Can cause severe illness or death, impacting farm productivity and pet health.

Sources of Nitrates

- **Plants:** Corn, sorghum, millet, beet tops, pigweed, and certain weeds tend to accumulate nitrates.
- Fertilizers: Excessive use of nitrogen fertilizers increases nitrate levels in plants and soil.
- Water: Contaminated wells or surface water can contain harmful nitrate concentrations.
- Environmental stressors such as drought, cloudy weather, or frost can increase nitrate accumulation in plants.

Animals Affected



Farm Animals:

- Ruminants (cattle, sheep, goats) are most susceptible.
- Horses and pigs are less commonly affected but can still suffer poisoning.



Pets:

- Dogs and cats may ingest nitratecontaminated water or plants, though cases are rare.
- Poisoning may occur if pets consume garden plants or contaminated water sources.

Why do they get sick?

High levels of nitrate impact the ability of blood to carry oxygen.

Result: hypoxia (lack of oxygen) at the tissue level, causing respiratory distress and organ damage.

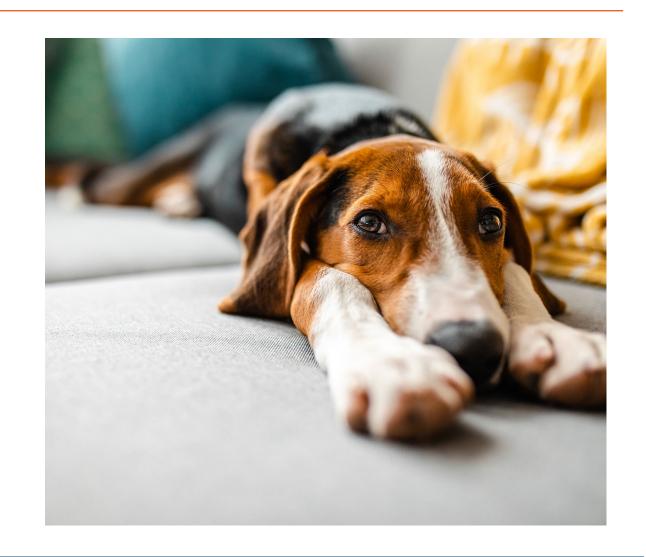
Severity depends on the dose and rate of nitrate ingestion.

Clinical Signs in Farm Animals

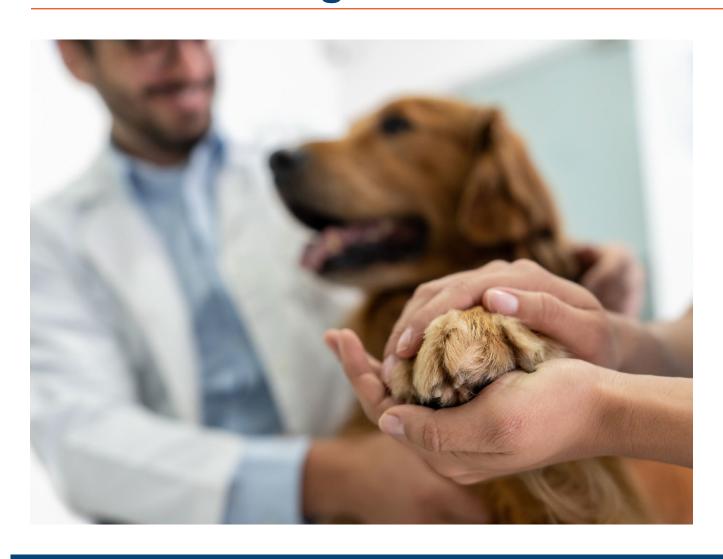
- Early signs: rapid and labored breathing, restlessness, muscle tremors.
- Weakness, staggering gait, and collapse as oxygen deprivation worsens.
- Mucous membranes appear bluish or brownish (cyanosis) due to methemoglobin.
- In severe cases, animals may die suddenly without other signs.

Clinical Signs in Pets

- Symptoms usually appear within hours after ingestion.
- Vomiting and diarrhea due to gastrointestinal irritation.
- Weakness, lethargy, and difficulty breathing.
- Cyanosis (blue gums or tongue) indicates lack of oxygen.
- Severe cases may lead to seizures, coma, or death if untreated.



Nitrates can be toxic to dogs, but toxicity depends on the amount ingested and the source.



Toxic dose:

Toxicity thresholds vary. In general, nitrate toxicity can occur in dogs at doses around 200-500 milligrams per kilogram (mg/kg) of nitrate.

Common Sources



Fertilizer ingestion



Contaminated water or well water with high nitrate levels



Certain plants like spinach, lettuce, beets, and some weeds can accumulate nitrates

Diagnosis



- History: Look for access to nitrate-rich feed, plants, or contaminated water.
- Clinical examination: Observe for cyanosis, breathing difficulty, and neurological signs.
- Laboratory tests: Blood methemoglobin levels are elevated (>15% is significant).
- Testing feed and water nitrate content helps confirm the source of poisoning.

Treatment

- Immediate removal of suspected nitrate sources to prevent further absorption.
- **Methylene blue** is the antidote; it helps convert methemoglobin back to hemoglobin.
- Supportive care includes oxygen therapy and intravenous fluids to support organ function.
- In severe cases, activated charcoal or rumen lavage may be used in farm animals.
- Early intervention improves survival chances significantly.

Prevention

- 1. Regularly test forage, water, and soil nitrate levels, especially during drought or after fertilization.
- 2. Avoid feeding plants known to accumulate nitrates or test them before feeding.
- 3. Provide animals with sufficient water and good nutrition to reduce nitrate uptake.
- 4. Rotate pastures and avoid grazing animals on fields recently fertilized or stressed by drought.
- 5. Educate farm workers and pet owners about the risks and early signs.

Summary

- Nitrate poisoning is a serious toxic condition primarily in ruminants but can affect pets.
- Caused by ingestion of high nitrate levels found in certain plants and contaminated water.
- Leads to methemoglobinemia, impairing oxygen transport and causing hypoxia.
- Recognizing clinical signs and early treatment with methylene blue are crucial.
- Prevention through management of feed and water sources is the best approach.

References / Further Reading

- Veterinary Toxicology textbooks (e.g., "Veterinary Toxicology" by Gupta)
- Extension service fact sheets from agricultural universities
- Recent research articles on nitrate toxicity in animals
- Animal health websites (e.g., Merck Veterinary Manual)



Thank you

